

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

KONECNI ET AL.

Serial No. 08/988,686 (TI-22166)

Filed December 11, 1997

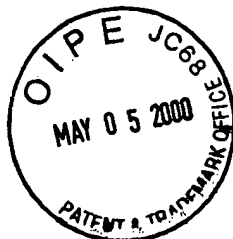
For: PLASMA PRE-TREATMENT TO REMOVE RESIDUES FORMED IN A VIA

Art Unit 2823

Examiner K. Eaton

Assistant Commissioner for Patents  
Washington, D. C. 20231

Sir:



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**BRIEF ON APPEAL**

**REAL PARTY IN INTEREST**

The real party in interest is Texas Instruments Incorporated, a Delaware corporation with offices at 7839 Churchill Way, Dallas, Texas 75251.

**RELATED APPEALS AND INTERFERENCES**

There are no known related appeals and/or interferences.

**STATUS OF CLAIMS**

This is an appeal of claims 21 to 25, all of the rejected claims. No claims have been allowed, claims 1 to 15 have been cancelled and claims 16 to 20 have been withdrawn from consideration. Please charge any costs to Deposit Account No. 20-0668.

## **STATUS OF AMENDMENTS**

No amendment was filed after final rejection.

## **SUMMARY OF INVENTION**

The invention relates to a method of fabricating an electronic device having a first electrically conductive structure electrically connected to a second electrically conductive structure situated over a semiconductor substrate. The method comprises the steps of forming a first electrically conductive structure (22), forming an insulating layer (22) over the first conductive structure, the conductive (sic) [this should be "insulating", the present wording in claim 21 being in error as is evidenced by the following paragraph of claim 21 and from the specification] structure having an opening with sidewalls and a bottom and exposes a portion of the first conductive structure. A gas comprised of hydrogen (46) is incorporated within a plasma which is directed into the opening in the insulating layer to remove residue (40) from the opening and then a conductive material (60) is deposited into the opening using chemical vapor deposition. The plasma can additionally be comprised of the inert gases of helium or argon and the conductive material is preferably comprised of a metal selected from the group consisting of: aluminum, copper, titanium, and a combination thereof.

## **ISSUES**

The issues on appeal are as follows:

### **ISSUE 1**

Whether the substitute specification conforms to 37 C.F.R. 1.125(b)

### **ISSUE 2**

Whether claim 21 is definite under 35 U.S.C. 112, second paragraph.

### **ISSUE 3**

Whether claims 21 to 25 are patentable over Nakata (U.S. 5,620,925) under 35 U.S.C. 103(a).

## **GROUPING OF CLAIMS**

The claims do not stand or fall together for reasons set forth hereinbelow under ARGUMENT.

## **ARGUMENT**

### **ISSUE 1**

The substitute specification was objected to as not conforming to 37 C.F.R. 1.125(b). This objection cannot be understood. The only basis for objection to the original specification was that the lines were too closely spaced and that holes were punched in the top of the disclosure. The hole punching was performed by the PTO and not by the applicant. However, in reply to the objection, an identical specification was filed which overcame the prior objections. Nothing was added or subtracted as was readily apparent and so stated in the response and therefore no new matter was added, nor was a marked up copy of the original specification required since there was nothing to

mark up. This was stated on page 3 of the response filed August 30, 1999 over the signature of a registered patent attorney.

### **ISSUE 2**

Claim 21 was rejected under 35 U.S.C. 112, second paragraph, as being indefinite in the clause "said conductive structure having an opening with sidewalls and a bottom and exposes a portion of said first conductive structure" having no antecedent basis. The rejection is without merit.

While this clause is in error as noted above, it is not indefinite. It merely states that the opening is in the conductive structure which is in error since the opening is in the insulating layer. Accordingly, the claim is definite and in error but not indefinite.

### **ISSUE 3**

Claims 21 to 25 were rejected as being unpatentable over Nakata (U.S. 5,620,925) under 35 U.S.C. 103(a). The rejection is without merit.

Claim 21 relates to a method of fabricating an electronic device having a first conductive structure electrically connected to a second conductive structure situated over a semiconductor substrate, the method comprising the steps of: forming the first conductive structure and forming an insulating layer over the first conductive structure, the conductive [this should be insulating] structure having an opening with sidewalls and a bottom and exposes a portion of the first conductive structure. The claim up to this point is admittedly old in the art. The principal inventive feature set forth in the claims on appeal relates to the step of removing residue from the opening by providing a gas comprised of hydrogen incorporated within a plasma into the opening in the insulating layer and then depositing a conductive material into the opening using chemical vapor deposition. The advantage of this type of chemistry is set forth on page 5 of the

specification which is that high ion energies are not required , thereby reducing or eliminating the undesirable deformation of high aspect ratio features or topologically sharp features often associated with modern semiconductor devices. As stated at page 3 of the specification, the prior art utilized chlorine or bromine chemistries that provided serious problems which are overcome by use of the chemistry of the present invention.

A review of Nakata clearly indicates that the chemistry used is the undesirable prior art chemistry mentioned in the subject specification, namely halogen chemistry, halogens being lithium, chlorine, bromine and iodine. The use of a hydrogen plasma chemistry is nowhere taught or even remotely suggested in Nakata et al. It follows that the inventive concept of the claims on appeal is nowhere taught or even remotely suggested by the cited reference.

Claims 22 to 25 depend from claim 21 and therefore define patentably over Nakata for at least the reasons set forth above with reference to claim 21.

In addition, claim 22 further limits claims 21 by requiring that the gas be additionally comprised of helium. No such combination is taught or suggested by Nakata.

Claim 23 further limits claim 22 by requiring that the gas be additionally comprised of argon. No such combination is taught or suggested by Nakata.

Claim 24 further limits claim 21 by requiring that the conductive material be comprised of a metal selected from the group consisting of: aluminum, copper, titanium, and a combination thereof. No such combination is taught or suggested by Nakata.

Claim 25 further limits claim 21 by requiring that the gas comprised of hydrogen incorporated within a plasma remove residue formed in the opening in the insulating layer. No such combination is taught or suggested by Nakata.

### CONCLUSIONS

For the reasons stated above, reversal of the final rejection and allowance of the claims on appeal is requested that justice be done in the premises.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'A. Cantor'.

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## **APPENDIX**

The claims on appeal read as follows:

21. A method of fabricating an electronic device having a first conductive structure electrically connected to a second conductive structure situated over a semiconductor substrate, said method comprising the steps of:

forming said first conductive structure;

forming an insulating layer over said first conductive structure, said conductive [this should be insulating] structure having an opening with sidewalls and a bottom and exposes a portion of said first conductive structure;

providing a gas comprised of hydrogen incorporated within a plasma into said opening in said insulating layer ; and

depositing a conductive material into said opening using chemical vapor deposition.

22. The method of claim 21, wherein said gas is additionally comprised of helium.

23. The method of claim 21, wherein said gas is additionally comprised of argon.

24. The method of claim 21, wherein said conductive material is comprised of a metal selected from the group consisting of: aluminum, copper, titanium, and a combination thereof.

25. The method of claim 21, wherein said gas comprised of hydrogen incorporated within a plasma removed residue formed in said opening in said insulating layer.